

CLAIMS**We claim:**

1. A method of drawing a brush stroke with a bitmap brush having pixels, the brush stroke rendered relative to a guideline, the guide line specifying an arbitrary path for the brush stroke, the method comprising the steps of:
5 determining a first polygon on the guideline; determining a first segment in the bitmap brush corresponding to the first polygon on the guideline; and applying a first transformation to a bitmap image mapped in the first segment in the bitmap brush to generate a corresponding bitmap image in the first polygon on the guideline.
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2. The method of claim 1 wherein the step of determining the first polygon comprises:
making a piece-wise linear approximation of the curved guideline, the piece-wise approximation having a plurality of line segments that are connected end to end;
15 generating sides of the first polygon at a first line segment in the plurality of line segments by drawing lines of specified length at the endpoints of the first line segment at least at one specified angle to the first line segment; and connecting the ends of the lines of specified length to complete the first polygon.
- 20 3. The method of claim 2 wherein the step of generating sides of the first polygon comprises:
generating a first side at a specified angle to a first line segment in the plurality of line segments, the first side having two first endpoints defining a length corresponding to a first desired thickness of the brush stroke at one end of the first line segment; generating a
25 second side at the specified angle to a second line segment in the plurality of line segments, and wherein the first line segment is adjacent to the second line segment segment, the second side having two second endpoints defining a length corresponding to a second desired thickness of the brush stroke at one end of the second line segment; and defining a first polygon having corners defined by the two first endpoints and the two
30 second endpoints.

4. The method of claim 2 wherein the step of generating sides of the first polygon comprises:
generating a first side, the first side having two first endpoints defining a length corresponding to a first desired thickness of the brush stroke at one end of the first line segment, wherein, furthermore, the first side dividing the angle between the first line segment in the guideline and an adjacent second line segment in the guideline;
generating a second side, the second side having two second endpoints defining a length corresponding to a second desired thickness of the brush stroke at one end of the second line segment, wherein, furthermore, the second side dividing the angle between the second line segment in the guideline and an adjacent third line segment in the guideline;
and defining a polygon having corners defined by the two first endpoints and the two second endpoints.
5. The method of claim 4 wherein the first side bisects the angle between the first line segment in the guideline and the adjacent second line segment in the guideline.
6. The method of claim 1 wherein the guideline forms a closed loop.
7. The method of claim 1 wherein the first transformation is a bilinear transformation.
8. The method of claim 7 wherein one of corner points of the first polygon is used to generate at least one parameter for the bilinear transformation.
9. The method of claim 1 wherein the first transformation is a texture mapping.
10. The method of claim 1 wherein a desired thickness for the brush stroke at a point on the curved guideline corresponds to a separation between a first line and a second line in the guideline.

11. The method of claim 2 wherein the step of making a piece-wise linear approximation of the guideline comprises:

selecting one of the lines in the guideline; and generating end to end connected linear segments, each of the linear segments approximating a segment of the selected line in the guideline.

12. The method of claim 11 wherein the step of generating end-to-end connected linear segments further includes dividing a linear segment into additional end-to-end connected linear segments in response to a user selection.

13. The method of claim 11 wherein the guideline has two lines specifying the thickness of the brush stroke, wherein furthermore the step of determining a first polygon comprises selecting a line segment in one of the lines specifying the thickness of the brush stroke, and selecting another line segment in another of the lines specifying the thickness of the brush stroke; and connecting ends of the selected line segments with straight lines to form the first polygon such that the first polygon is a convex polygon.

14. The method of claim 11 wherein the guideline has two lines specifying the thickness of the brush stroke, wherein furthermore the step of determining a first polygon comprises: selecting a line segment in one of the lines specifying the thickness of the brush stroke, and selecting a point in another of the lines specifying the thickness of the brush stroke; and connecting ends of the selected line segment with straight lines to the selected point to form the first polygon such that the first polygon is a convex polygon.

15. The method of claim 11 wherein the step of generating end-to-end connected linear segments for one of the lines in the guideline further includes adding a linear segment adjacent to another linear segment at an angle greater than a specified corner threshold.

16. The method of claim 11 wherein the step of generating end-to-end connected linear segments for one of the lines in the guideline further includes replacing a sharp

curve, the sharp curve defined by two adjacent linear segments making an angle with each other of less than a specified corner threshold, by a rounded corner prior to generating end-to-end connected linear segments.

- 5 17. The method of claim 2 wherein the step of generating the first polygon includes truncating a portion of the first polygon overlapping with a second polygon to generate a first convex polygon and a second convex polygon.

- 10 18. The method of claim 17 wherein the step of applying the first transformation uses a modified first segment in the bitmap brush, the modified first segment having proportionally reduced brush thickness to correspond to the first convex polygon, to generate a corresponding image in the first convex polygon.

- 15 19. A computer-readable medium having computer-executable instructions for performing steps of a method for drawing a brush stroke with a bitmap brush having pixels, the brush stroke rendered relative to a guideline, the guide line specifying an arbitrary path for the brush stroke, the steps comprising:
determining a first polygon on the guideline; determining a first segment in the bitmap brush corresponding to the first polygon on the guideline; and applying a first
20 transformation to a bitmap image mapped in the first segment in the bitmap brush to generate a corresponding bitmap image in the first polygon on the guideline.

20. The computer-readable medium as in claim 19, wherein the step of determining the first polygon comprises:
25 making a piece-wise linear approximation of the curved guideline, the piece-wise approximation having a plurality of line segments that are connected end to end; generating sides of the first polygon at a first line segment in the plurality of line segments by drawing lines of specified length at the endpoints of the first line segment at at least one specified angle to the first line segment; and connecting the ends of the lines
30 to complete the first polygon.

21. The computer-readable medium as in claim 19, wherein the step of generating sides of the first polygon comprises:

generating a first side at a specified angle to a first line segment in the plurality of line segments, the first side having two first endpoints defining a length corresponding to a first desired thickness of the brush stroke at one end of the first line segment;

generating a second side at the specified angle to a second line segment in the plurality of line segments, and wherein the first line segment is adjacent to the second line segment segment, the second side having two second endpoints defining a length corresponding to a second desired thickness of the brush stroke at one end of the second line segment; and
 10 defining a first polygon having corners defined by the two two first endpoints and the two second endpoints.

22. The computer-readable medium as in claim 19, wherein the step of generating sides of the first polygon comprises:

15 generating a first side, the first side having two first endpoints defining a length corresponding to a first desired thickness of the brush stroke at one end of the first line segment, wherein, furthermore, the first side dividing the angle between the first line segment in the guideline and an adjacent second line segment in the guideline;
 generating a second side, the second side having two second endpoints defining a length
 20 corresponding to a second desired thickness of the brush stroke at one end of the second line segment, wherein, furthermore, the second side dividing the angle between the second line segment in the guideline and an adjacent third line segment in the guideline;
 and defining a polygon having corners defined by the two first endpoints and the two second endpoints.

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23. The computer-readable medium as in claim 22, wherein the first side bisects the angle between the first line segment in the guideline and the adjacent second line segment in the guideline.

30 24. The computer-readable medium as in claim 19 wherein the guideline forms a closed loop.

25. The computer-readable medium as in claim 19 wherein the first transformation is a bilinear transformation.

5 26. The computer-readable medium as in claim 25 wherein one of corner points of the first polygon is used to generate at least one parameter for the bilinear transformation.

27. The computer-readable medium as in claim 19 wherein the first transformation is a texture mapping.

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28. The computer-readable medium as in claim 19 wherein a desired thickness for the brush stroke at a point on the curved guideline corresponds to a separation between a first line and a second line in the guideline.

15 29. The computer-readable medium as in claim 20 wherein the step of making a piece-wise linear approximation of the guideline comprises:
selecting one of the lines in the guideline; and generating end to end connected linear segments, each of the linear segments approximating a segment of the selected line in the guideline.

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30. The computer-readable medium as in claim 29 wherein the step of generating end-to-end connected linear segments further includes dividing a linear segment into additional end-to-end connected linear segments in response to a user selection.

25 31. The computer-readable medium as in claim 29, wherein the step of generating end-to-end connected linear segments for one of the lines in the guideline, the guideline having two or more lines wherein the separation between the lines corresponds to a desired thickness of the brush stroke, further includes dividing a linear segment into additional end-to-end connected linear segments if the change in the separation between
30 the two lines over the linear segment is greater than a specified thickness threshold.

32. The computer-readable medium as in claim 29 wherein the guideline has two lines specifying the thickness of the brush stroke, wherein furthermore the step of determining a first polygon comprises selecting a line segment in one of the lines specifying the thickness of the brush stroke, and selecting another line segment in another of the lines specifying the thickness of the brush stroke; and connecting ends of the selected line segments with straight lines to form the first polygon such that the first polygon is a convex polygon.

33. The computer-readable medium as in claim 29 wherein the guideline has two lines specifying the thickness of the brush stroke, wherein furthermore the step of determining a first polygon comprises: selecting a line segment in one of the lines specifying the thickness of the brush stroke, and selecting a point in another of the lines specifying the thickness of the brush stroke; and connecting ends of the selected line segment with straight lines to the selected point to form the first polygon such that the first polygon is a convex polygon.

34. The computer-readable medium as in claim 29 wherein the step of generating end-to-end connected linear segments for one of the lines in the guideline further includes adding a linear segment adjacent to another linear segment at an angle greater than a specified corner threshold.

35. The computer-readable medium as in claim 29, wherein the step of generating end-to-end connected linear segments for one of the lines in the guideline further includes replacing a sharp curve, the sharp curve defined by two adjacent linear segments making an angle with each other of less than a specified corner threshold, by a rounded corner prior to generating end-to-end connected linear segments.

36. The computer-readable medium as in claim 19, wherein the step of generating the first polygon includes truncating a portion of the first polygon overlapping with a second polygon to generate a first convex polygon and a second convex polygon.

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